University of South Carolina; School of Medicine (USC SoM)

Richard Davis, MD

The Rural Primary Care Education Projects in Bennettsville, Kershaw, and Winnsboro, S.C., serve as platforms for research on rural health care delivery, including tele-medicine. In addition, the SoM houses the South Carolina Tele-medicine Network that provides capacity for the Department of Ophthalmology's health outcomes research. In this extramurally funded study translational research will be used to evaluate tele-medicine technology using interactive video conferencing as a novel means to increase the availability of health professionals in rural communities for the effective delivery of a diabetes self-management education program and as a means to provide retinal screenings in the primary care setting.

Rural Primary Care Center Network

Building on its primary mission to train physicians who serve the state's underserved populations, the USC School of Medicine created the Rural Primary Care Center Network. In 1991, the John A. Martin Primary Health Care Center opened in Winnsboro, providing educational experiences for USC medical students and health care to residents of Fairfield County. In 1998, Kershaw Family Medicine was created in partnership with Springs Memorial Hospital. A third center, McLeod-Bennettsville Family Medicine, was established in 2001 in medically underserved Marlboro County.

USC SoM has metro Ethernet provision to rural sites in Kershaw, Bennettsville, and Winnsboro. This is primarily related to the video conferencing capabilities in support of tele-medicine activities for the SoM.

IX. PSPN Governance, Project Management, and Work Plan[9]

Governance

The Palmetto State Providers Network (PSPN) is organized as a subsidiary of the Health Sciences South Carolina, an organization within the meaning of Section 501 (c)(3) of the Internal Revenue Code. The PSPN will be governed by a board consisting of members from: HSSC (2), rural hospitals from the SC Hospital Association (2), SC Rural Primary Health Care Association (2), AHEC (1), and four at-large rural primary care physicians.

The PSPN Board members will be selected by the HSSC Board with input from respective organizations. Members will serve for two years with membership staggered to

[9] Addresses application requirement #9 – Governance and Project Management

provide continuity in membership. The PSPN Board will organize itself, develop a charter, elect officers, and approve budgets. Additionally, there will be a tele-health / tele-medicine advisory committee that will oversee the programmatic activities of PSPN. This committee will have members from Medical University of SC (MUSC), University of SC School of Medicine (USC SoM), Palmetto Richland Health System (PRHS), Greenville Hospital System (GHS), Spartanburg Regional Medical Center (SRMC), AHEC, South Carolina Primary Health Care Association (SCPHCA), SC Hospital Association (SCHA), and two rural-based primary care physicians. The PSPN Governance Board will determine committee members to represent the above organizations. (See Appendix A for a detailed Governance structure).

Management

Dr. Frank Clark is the Vice President for Information Technology and CIO at MUSC. He chairs the HSSC CIO Committee and will serve as the overall PSPN project coordinator / manager. He will act as the interlocutor between the HSSC Board and the PSPN Board.

Dr. Roger Poston of MUSC will coordinate the tele-medicine / tele-health activities of the PSPN across the state; he will work closely with the advisory committee in this capacity. His services will be provided by HSSC. Dr. Poston will assist Dr. Clark in the overall management of PSPN.

Project management expertise will be provided by the MUSC Project Management Officer (Dan Furlong, PMP, MBA), of the MUSC Office of the CIO. Dr. Clark and Mr. Furlong's services will be provided by HSSC.

Dr. Clark will oversee the day to-day operations and management of the PSPN with some assistance from Dr. Poston and HSSC operations staff. His activities will be done with oversight from the PSPN Board. The operational management (NOC) of the PSPN physical network will be outsourced to a network vendor. This will include a 7/24 help desk and trouble ticket tracking.

Planning

Extensive planning for the fiber backbone (SCLR) has been under way for eighteen months, employing a formal project management methodology and defined procedures for adopting standards, procedures, and guidelines. A working group of professional IT staff and network experts from HSSC has visited successful statewide networks in Georgia, North Carolina, and Florida and has examined best practices in additional states (OH, IN) that may serve as models for South Carolina. The working group has consulted regularly with potential industry partners such as Cisco, PalmettoNet, SCANA, DukeNet, and BellSouth. The working group has been charged with identifying fiber throughout South Carolina, exploring options for securing long-term fiber lease, writing

specifications for optical switches and site preparations, and developing operating procedures, articles of incorporation (if needed), and all budgets for the network.

The working group has developed a detailed scope statement and technical requirements for implementation (Appendix B). This same HSSC working group has also assisted in the development of detailed plans for expanding the fiber backbone using a combination of Ethernet/MPLS, Frame Relay, Private Line T1 and WiMAX wireless clouds to the smaller rural communities with the goal of connecting as many rural care providers across the state as possible. See the following sections for more details and Appendix D for diagrams.

SCLR Backbone

Fiber Discovery and Network Equipment Infrastructure

The network-working group has received a report from FiberCo, LLC, (Appendix C) identifying fiber assets in South Carolina and estimating costs to secure long-term leases for those assets. (FiberCo is a not-for-profit subsidiary of Internet2/NLR.) The network as currently designed will require approximately 1000 miles of fiber (two pairs) throughout the state. The working group also has engaged in non-disclosure discussions with SCANA Communications, Level3, and DukeNet about additional fiber assets that maybe available for this network.

Specifications have been written and cost estimates prepared for optical switches and equipment necessary to connect the initial phases of the network, to include all six HSSC sites and regional and national networks. The network design will readily allow for ethernet local loop circuits and WiMAX expansion and inclusion of additional participants such as the more than thirty rural hospitals and the nineteen community health centers that are part of the SC Primary Care Health Providers Association, as well as, hundreds of community based physician practices across the state.

Fiber Network Development

Plans have been developed identifying all switch sites of the network across South Carolina. The SCLR fiber network will have optical switches serving as hubs through which other hospitals, community heath centers, clinics, health departments, and office based practices may connect to the network. The backbone of PSPN, the SCLR will be a scalable DWDM (dense wave division multiplexing) or lit fiber network capable of increasing bandwidth on demand.

PSPN Pilot Program

Overview

The Palmetto State Provider Network initiative proposes a high-speed data network linking rural non-profit healthcare providers across the four regions of the state (Upstate, Midlands, PeeDee, and Lowcountry) to the academic and large tertiary medical center. PSPN will be an extrapolation of the SC Light Rail as discussed earlier. Once connected, these rural care providers will have access to high speed commercial Internet, Internet2/NLR, and medical knowledge centers across the state. This network will be comprised of high capacity Ethernet local loops and Gigabit / 10Gb Ethernet/wavelength long haul circuits. A majority of the infrastructure required to assemble this network is commercially available, but to date has not been utilized for advanced healthcare applications due to costs.

Network Architecture

The telecommunication component of the PSPN will be a extrapolation/expansion of SCLR, the fiber optics backbone, out to the following South Carolina rural communities: Beaufort, Walterboro, Summerville, Georgetown, Kingstree, Myrtle Beach, Conway, Allendale, Bamberg, Sumter, Darlington, Bennettsville, Camden, Newberry, Laurens, Greenwood, Orangeburg, Florence, Mullins, Aiken, Rock Hill, Anderson, Greer, Easley, Rock Hill, Chester, Union, and Gaffney (PSPN Network map: Appendix D). Most of theses communities are under 25,000 in population. The PSPN links off of the SCLR will use a combination of Metro Ethernet/MPLS, Frame Relay, Private Line T1 and WiMAX wireless (where available) to provide the bandwidth needed. These links will establish 2nd tier point-of-presence (POPs) for the PSPN, usually located in the area rural hospital. If WiMax is available, around each of the more than thirty POPs we will establish a WiMAX wireless telecommunications cloud to which care givers within a thirty-mile radius can connect to the PSPN. This effort will provide sufficient broadband connections for rural hospitals, community health centers and office based practice to large tertiary centers, academic medical centers and out to the "world." The broadband links of PSPN will encourage and enhance existing tele-medicine programs (radiology, cardiology, peds, etc.) and tele-health activities from the state's two academic medical centers to rural providers.

Thirty two (32) rural healthcare facilities (hospitals) across the state will be served by this proposed network. Access will be offered in 10 Mb Ethernet connection speed. The rural hospitals are dispersed across the four regions of South Carolina and will connect to core routers to be located across the state. Connectivity to commercial Internet and NLR or Internet2/NLR will be available through this core router via a dedicated high-speed connection through SCLR to Atlanta, GA. A detailed survey has been conducted on each facility to ensure that network facilities are available to provide the desired connectivity. The basic design of this network will allow other eligible healthcare facilities and providers to ultimately connect to the network through hubs to be established at each rural hospitals/community health center.

Regional Connections

In addition to access to external research networks like Internet2/NLR, we plan to establish direct connections to other networks in adjoining states, providing a regional exchange of information and services.

Self Sufficiency

Private and for-profit Medical service providers will be encouraged to connect to this network on a subscription basis to exchange traffic with the rural hospitals and access external applications and networks such as Internet2/NLR.

In addition to subscriptions from for-profit entities, the network will allow participating locations to access commercial Internet services via the same connection, displacing existing Internet access costs. The displacement of these expenses will enable the public/non-profit facilities to cover the costs of the network not funded by the grant. (15%) This will add to the sustainability of the network long term.

Physical PSPN Network Management

Management of the network and help-desk functions will be provided through a centralized network management group (vendor supplied). Proactive monitoring of network connections and VPNs will be accomplished with advanced network monitoring tools. Equipment placed at each subscriber site will allow remote troubleshooting and diagnostics. The proposed network will be monitored 7x24 and supported by a help desk to promptly resolve connection issues.

Network Security

The proposed network design includes protections designed to ensure very high levels of network security. Firewalls will be established at each location served preventing unauthorized access to other users or databases. A core router dedicated to this network will enable the exchange of information and appropriate peering with other networks.

X. Schedule and Budget[10]

Schedule

Milestones	Projected Date
RFI issued for SCLR	Nov 2006
Work with respective associations to identify SC rural hospitals, community health centers, physicians' offices	Nov 2006
Letters seeking support for application sent to providers	Dec 2006
Submit FCC pilot program proposal	April 2007
RFP issued for SCLR	May 2007
Select vendor for fiber optics backbone, SCLR	June 2007
Negotiate and sign contract for fiber backbone	July 2007
Work with respective SC healthcare association leadership to solicit provider participation in PSPN	July 2007
Establish PSPN Governance Board	July 2007
Establish PSPN Programmatic Advisory Committee	July 2007
PSPN Governance Board approve rural communities/towns to link to fiber backbone	August 2007
SCLR working group oversees SCLR implementation	August 2007
RFP issued for 32 Ethernet local loops & help desk function	August 2007
SCLR go live	August 2007
Negotiate and sign contract for local loops	September 2007
SCLR/PSPN working group oversees PSPN implementation	October 2007
PSPN go live	October 2007

Budget

Expenses Year 1

10GB (20 yr. IRU) with I2 link (help desk & NOC)	$4,385,000
Connection to Internet2/NLR (one time)	200,000
Internet2/NLR Annual Membership	125,000
32 Ethernet Local Loop Circuits (help desk & NOC)	1,894,000
Administrative Costs	50,000
EHR Expense	200,000
Total Year 1 Expenses	**$6,854,000**

[10] Addresses application requirement #9 – Schedule and Budget.

Revenue Year 1

RHC Funding	$5,783,400
HSSC Funding	1,070,600
Membership fees (for-profit)	50,000
Total Year 1 Revenues	**$6,904,000**

Expenses Year 2

10GB Fiber Maintenance & Recurring Costs (help desk & NOC)	$1,000,000
Internet2/NLR Annual Membership	125,000
32 Ethernet Local Loop Circuits (help desk & NOC)	1,218,000
Administrative Costs	50,000
EHR Expense	100,000
Total Year 2 Costs	**$2,493,000**

Revenue Year 2

RHC Funding	$2,076,550
HSSC Funding	316,450
Membership fees (for-profit)	100,000
Total Year 1 Revenues	**$2,493,000**

XI. Coordination of PSPN Tele-medicine Programs Throughout SC[11]

A detailed review of existing tele-medicine / tele-health services within the state has been conducted. It is anticipated that the existing programs will be enhance and improved with the availability of broadband connectivity. Rural caregivers (office based physicians, community health center, hospitals) will be surveyed to determine what type of services that can be provided to them via broadband would improve the delivery of care.

With the acute shortage of pediatric radiologists in the state, rural based OB/GYN physicians participating in PSPN will have access to the services of MUSC based pediatric radiologists who can do reads via the broadband network.

The intent is to offer to PSPN participating physicians access to a web based electronic health record (EHR). This offering would be in the form of an application service provider (ASP) model and at minimal annual cost to the provider. The PSPN will consider two EHRs; one developed by the State Office of Research and Statistics and the

[11] Addresses application requirement #10 – Tele-medicine Coordination.

other developed by Dr. Brent Egan (MUSC) et al as part of an NIH funded statewide hypertension study.

The programmatic functions/activities of PSPN will be coordinated out of Health Sciences South Carolina, specifically by Dr. Roger Poston, Director of Academic and Research Computing in the Office of the CIO at the Medical University of SC. Dr. Poston has previous experience in this area at the Wake Forest / Bowman Grey School of Medicine. Dr. Robert Rainer, Medical Director at SRMC, will assist Dr. Poston in this effort. Dr. Poston will work closely with Dr. Rainer and the PSPN tele-health / tele-medicine advisory committee consisting of ten members with representatives from Medical University of SC (MUSC), University of SC School of Medicine (USC SoM), Palmetto Richland Health System (PRHS), Greenville Hospital System (GHS), Spartanburg Regional Medical Center (SRMC), AHEC, South Carolina Primary Health Care Association (SCPHCA), SC Hospital Association (SCHA), and two rural-based primary care physicians. Many of the tele-medicine programs will imamate from the HSSC hospital facilities along with other tertiary centers across the state. Dr. Poston's role will be to work with rural caregivers to identify needs and to coordinate the needs back to academic and tertiary centers. This coordination effort will be in done with the tele-medicine advisory committee. Dr. Poston and the advisory commitee will identify / establish baseline measures and metrics to monitor the success of the activities. Dr. Poston's time spent on this coordination effort will be part of HSSC's contribution to the PSPN.

XII. Sustaining PSPN Over Time[12]

Funding Model

In order to sustain PSPN as an ongoing initiative, HSSC is requesting that the following model be used:

- RHC fund 85% of the one time and 85% of first and second year recurring cost of the 10GB fiber optics backbone, SC Light Rail.
- HSSC and its three research universities will fund the ongoing support and enhancements of the fiber optics backbone.
- RHC fund 85% of the one time cost and 85% of the two year recurring cost of the second tier Ethernet local loops out to the rural hospitals.
- RHC fund 85% of the two year cost for the EHR.
- After year two, the sustaining costs of the second tier local loops and EHR will be provided through a combination of the following sources: RHC funding, if available, HSSC grant funds, a portion of the fees generated from the tele-medicine / tele-health / remote ICU monitoring programs, fees collected from for-profit network members and other state (Health & Human Services) and Federal (Medicare & Medicaid) grants.

[12] Addresses application requirement #11 – Sustaining the Network.

Funding Request from RHC

Year 1	$5,783,400
Year 2	$2,076,550

It will be incumbent upon the PSPN governance board to work with the HSSC leadership and the programmatic advisory committee to develop specific funding strategies to support PSPN long term.

APPENDICES

GOVERNANCE

Article 1

The name of the network shall be the Palmetto State Providers Network (PSPN)

Article II

Purpose: The Palmetto State Providers Network (PSPN) is organized as a subsidiary of the Health Sciences South Carolina, an organization within the meaning of Section 501 (c)(3) of the Internal Revenue Code. The PSPN is constructed specifically for improving rural healthcare in the state of South Carolina.

Article III

Directors: The PSPN shall be governed by a Board of Directors (the Board) of not less than twelve members. The Board of Directors shall consist of members from the following organizations: HSSC (2), SC Hospital Association (2), SC Primary Health Care Association (2), AHEC (2), and four at large rural primary care physicians.

Each Director shall be appointed for a three year term and serve until his or her successor is duly appointed and qualified for the position of Director. The terms of Directors shall be staggered such that the terms of office of a pro rata number of the then serving Directors expire in any one year.

Initial Directors: The members of the initial Board of Directors shall consist of representatives of the following institutions, each of whom shall serve for the term beginning on the stated date and ending on the date stated and until his or her successor shall have been duly appointed and qualified for the position of Director. They will be appointed by the boards of the respective organizations:

Member Institutions
Health Sciences South Carolina
SC Primary Health Care Association
SC Hospital Association
SC Medical Association

Addition of Directors: Additional Directors may be added to the Board of Directors, the PSPN, upon official recognition of new institutions and organizations with participating

and collaborating members in the state of South Carolina. The President or Chief Executive Officer of the new and officially recognized organization or institution shall appoint their representative Director. The Director shall serve a three year term and until his or her successor shall have been duly appointed and qualified for the position of Director. Directors shall be staggered such that the terms of office of a pro rata number of then serving Directors expire in any one year.

Compensation and Expenses of Directors: Directors shall receive no compensation for their services as Directors, but may be reimbursed for their out-of-pocket expenses incurred in carrying out the business and affairs of the Board of Directors of the PSPN.

Chair and Vice Chair: The Board of Directors shall elect at its first regular meeting, by the majority of vote of all persons then serving as Directors, one of its members to serve as the Chair of the Board of Directors, PSPN. They shall also elect by like vote one other of its members to serve as Vice-Chair of the Board. Both the Chair and Vice-Chair shall be elected for one year terms and will serve until his or her respective successor has been duly elected and qualified. A Chair or a Vice-Chair may serve one or more terms of office. The Chair shall preside at all meetings of the Board of Directors and perform duties as usually pertain to the position of Chair. The Vice-Chair shall serve in the absence of the Chair and perform all further duties, which usually pertain to the position of Vice-Chair.

Meetings: The Board shall hold meetings at such place and time as determined by the Board. Meetings shall be conducted at least quarterly per year. Special meetings of the Board may be called by the Chair of the Board of Directors or by written request of at least one-half of the membership of the Board of Directors of the PSPN. Request for special meetings must be submitted in writing to the Chair and distributed either in writing or by phone call to the members of the Board of Directors, the PSPN at least 48 hours prior to the special meeting.

Quorum and Required Vote: At each meeting of the Board of Directors, the PSPN, the presence of one-half of the full number of Directors then serving shall constitute a quorum sufficient for the transaction of business. Any action of a majority of the Directors present at a meeting at which a quorum is present shall be the official act of the Board, except as may be otherwise specifically provided. In the event of a tie vote on any matter before the Board, a vote to break such a tie shall be cast by the Chair, or in his or her absence, by the Vice-Chair.

Conference Telephone Meeting: Directors may participate in a meeting of the Board by means of conference telephone, video conferencing or similar communications equipment whereby all persons participating in the meeting can hear each other. Participation in the meeting shall constitute presence in person.

Article IV

Removal of Director: Any Director, Chair or Vice-Chair may be removed from his or her respective position by a resolution duly adopted by two-thirds super-majority of all persons elected and then serving as Directors, whenever in their judgment the best interest of the PSPN will be served by such removal.

Resignation of Director, Chair or Vice-Chair: Any Director, the Chair or Vice-Chair of the Board may, at any time, resign from his/her respective position by giving written notice of his or her resignation. Such resignation shall take effect at the time specified in such notice, or, if no time is specified at the time of the Chair's receipt of such notice.

Appointment of Replacement Director: In the event of death, resignation or removal of any Director, a new Director shall be appointed by the President or Chief Executive officer of the respective institution or organization.

Election of Replacement Chair or Vice-Chair: In the event of death, resignation or removal of the Chair of Vice-Chair of the Board, a new Chair or Vice-Chair may be elected by the Board of Directors by the same vote required by these policies and procedures to elect a Chair or Vice-Chair, for such term as is specified, but in no event longer than the remaining term of the position being succeeded, at the regular meeting of the Board following such death, resignation or removal, or at a special meeting of the Board of Directors called for such purpose.

Article V

Committees: Those committees not having and exercising the authority of the Board in the management of the PSPN may be designated by a resolution adopted by a majority of the Directors present at a meeting at which a quorum is present. Except as otherwise provided in such resolution, members of each such committee shall be members of the PSPN and appointed by the Board.

Committee Chairs: Except as otherwise provided, one member of each committee shall be appointed committee Chair by the person authorized to appoint that committee's membership, or, in lieu thereof, upon majority vote of all the members then serving on such committee.

Vacancies: As vacancies occur, the membership of any committee may be filled by appointments made in the same manner as provided in the case of the original appointments.

Quorum: Unless otherwise provided by the Board of Directors, a majority of the whole committee shall constitute a quorum and the act of a majority of the members present at meeting at which a quorum is present shall be the act of the committee.

SCLR Design Document

Project Name:	South Carolina Light Rail
Project Manager	Kevin Gremann
Project Sponsor	HSSC
Date	6/29/2006

Revision History

Version	Author	Date (MM/DD/YYYY)	Comments
1.0	Kevin Germann	06/13/2006	Original DRAFT

SCLR Project Summary

This project is the implementation of a high speed, high bandwidth South Carolina Light Rail. The network will utilize dark fiber and DWDM optical technologies. This network will support the needs of higher education for research and distance education and the needs of the Health Sciences South Carolina collaborative (HSSC).

The scope of this project is the design and implementation of the new network infrastructure and associated standards and business processes. The scope does not include the selection and migration of specific applications to the new infrastructure. Project closure will occur upon the acceptance of the new infrastructure by the project sponsor

Terms/Abbreviations/Acronyms

CWDM	**Coarse Wave Division Multiplexing eight (8) or fewer wavelength channels**
DWDM	**Dense Wavelength Division Multiplexing an optical technology used to increase bandwidth over existing fiber optic backbones**
SCLR	**South Carolina Light Rail**
SME	**Subject Matter Expert**

Business Requirements

Business Requirement 1

- Provide dynamic bandwidth allocation across the entire DWDM network.

Business Requirement 2

- SCLR have the ability to provide dedicated circuits for stand alone projects as well as projects that span a group of researches.

Business Requirement 3

- Support large data transfer such as multimedia requirements.

Business Requirement 4

- Provide QOS

Business Requirement 5

- Provide a 24x7 redundant network.

Business Requirement 6

- Provide segregated, isolated traffic upon demand.

Business Requirement 7

- Establish Network Operations Center (NOC)

Business Requirement 8

- Establish monitoring tools to be accessible by all members

Business Requirement 9

- Provide a "Trouble Ticket System"

Business Requirement 10

- Establish a video conferencing infrastructure (gateways, etc)

Business Requirement 11

- Provide/establish security standards (HIPAA, FERPA, GLB)

Business Requirement 12

- Create the ability to add new sites (aggregation points)

Business Requirement 13

- Aggregation – Internet, Internet 2, NLR (this is the one bullet that begins with a noun instead of a verb; consistency is best)

Business Requirement 14

- Complete documentation for the entire network architecture

SCLR Project Definition Section

Objectives & Approaches

Work sessions have been held with stakeholders and SME's to determine the business requirements, objectives, and technical approaches for this phase. They consist of the following components:

Business Requirement 1:

- Provide dynamic bandwidth allocation across the entire DWDM network.

Objective 1:

- Obtain optical hardware vendor
- Define bandwidth increments (i.e. 1GB, 2.5G)
- Define SLA (i.e. time to respond, cost, QOS, duration)
- Obtain web based scheduling tool (user request & NOC setup)

Approach 1:

- Define short list of vendors
  - Develop hardware requirements for RFQ

        - Determine procurement method (exp. Best Value)
        - Determine evaluation criteria
        - Determine procurement and funding
    - Write the standard (best practices)
        - Define delivery interface
        - Define committee to focus on SLA's
    - Define SLA's needed
        - Define parts of SLA's (metrics/assessment)
            - SCLR responsibilities
            - Institution/member responsibilities
    - Buy/build user-side scheduling tool workflow (interface with vendor tool)
        - Define short list of vendors
        - Develop hardware requirements for RFQ
        - Determine procurement method (exp. Best Value)
        - Determine evaluation criteria
        - Determine procurement and funding
        - Configure tool (NOC piece)

Business Requirement 2:

- SCLR have the ability to provide dedicated circuits for stand alone projects as well as projects that span a group of researches.

Objective 2:

- Obtain optical hardware vendor
- Create an application review board (expectations and needs assessment)
- Determine capacity management / governance ,,, "who can get what" and how long
- Create setup checklist
- Create provisioning procedures

Approach 2:

- Define short list of vendors
    - Develop hardware requirements for RFQ
    - Determine procurement method (exp. Best Value)
    - Determine evaluation criteria
    - Determine procurement and funding
- Setup membership of application review board (charter procedure)
    - Develop a checklist to use during interview with requester
    - Determine evaluation criteria
- Develop cost recovery model ("what's free, what's extra")
    - Develop procedure
    - Define basic level of service (included in membership fee) and enhanced/extra services (available for extra price)
- Create the checklist
    - Develop customer site survey
- Create procedure for provisioning

Business Requirement 3:

- Support large data transfer such as multimedia requirements.

Objective 3:

- Define vendor requirements for optical hardware.
- Define protocols
- Create IP addressing (V.4 or V.6) standards and procedures
- Create routing standards and procedures

Approach 3:

- Define short list of vendors
  - Develop hardware requirements for RFQ
  - Determine procurement method (exp. Best Value)
  - Determine evaluation criteria
  - Determine procurement and funding

Business Requirement 4:

- Provide QOS

Objective 4:

- Establish standards
- Adhere to ITIL practices
- Create IP addressing (V.4 or V.6) standards and procedures
- Create routing standards and procedures

Approach 4:

- Define traffic types and assign priority to types
- Develop standards and procedures

Business Requirement 5:

- Provide a 24x7 redundant network.

Objective 5:

- Develop pathways
- Define hardware
- Define power backup generator
- Develop staffing requirements
- Define redundant connections for Internet, Internet 2, NLR

Approach 5:

- Research existing fiber discovery
  - Develop backbone design (fiber plant)
  - Define level of redundancy required
- Define short list of vendors
  - Develop hardware requirements for RFQ (all hardware, all sites)
  - Determine procurement method (exp. Best Value)

        - Determine evaluation criteria
        - Determine procurement and funding
    - Conduct risk assessment
    - Define skill requirements
        - Define staffing levels and funding
    - Determine level of redundancy
        - Define aggregation points
        - Select vendor ISP's
        - Negotiate rates
        - Procure

Business Requirement 6:

- Provide segregated, isolated traffic upon demand.

Objective 6:

- Obtain optical hardware vendor
- Create a application review board (expectations and needs assessment)
- Determine capacity management / governance ,,, "who can get what" and how long
- Create setup checklist
- Create provisioning procedures
- Create standards and procedures
- Develop inter-institution VLAN support

Approach 6:

- Develop procedures and standards

Business Requirement 7:

- Establish Network Operations Center (NOC).

Objective 7:

- Obtain location and physical space requirements
    - Develop USC as primary NOC, integrate with existing NOC's)
    - Develop design and funding (equipment and staffing)
    - Develop facilities requirements
    - Develop staff requirements
    - Creation of standards and procedures
- Obtain location and physical space requirements for Future Needs
    - Develop separate NOC/ computer center
- Determine metrics and monitoring tools needed for NOC

Approach 7:

- Assign task team
    - Establish requirements (Present and future) including M & M
    - Conduct site visits
    - Establish agreement with USC NOC regarding present and future sites

- Determine document requirements
- Identify and secure new location
- Develop cost estimates (equipment and staffing)
- Build and test
- Develop policies and procedures
- Hire and train staff

Business Requirement 8:

- Establish monitoring tools to be accessible by all members

Objective 8:

- Define types of monitoring tools needs
- Identify existing monitoring tools
- Develop non-existing monitoring tools
  - Policies and procedures
- Develop implementation and training plan
- Identify reporting requirements (What, Who, When)
  - Periodic review and assessment
  - Capable of event notification

Approach 8:

- Determine document requirements
- Evaluate existing solutions
- Conduct site visits and check references
- Develop cost estimates (equipment and staffing)
- Purchase and implement
- Hire and train staff
- Build and test
- Develop policies and procedures

Business Requirement 9:

- Provide a "Trouble Ticket System"

Objective 9:

- Define requirements
- Evaluate current system in place at USC
  - Incorporate, or create new
- Develop funding for equipment and ongoing maintenance cost
- Create policies and procedures for Backup NOC
- Create reporting and documentation processes
- Define accessibility standards and procedures

Approach 9:

- Determine document requirements
- Evaluate existing solutions
- Conduct site visits and check references
- Develop cost estimates (equipment and staffing)
- Purchase and implement
- Hire and train staff

- Build and test
- Develop policies and procedures

Business Requirement 10:

- Establish a video conferencing infrastructure (gateways, etc)

Objective 10:

- Create an inventory of existing system and network
- Define limits of this project in terms of UTC system (gateways, gate keepers, endpoints
- Create funding requirements (incl. equipment and staff)
- Determine integration into campus education communities, research and patient care.
- Develop management and maintenance methods.
- Creation of standards and policies and procedures
- Define reporting and documentation standards
- Establish the metrics and monitoring methods
- Define QOS standards in regards to video conferencing

Approach 10:

- Establish a task group
  - Assign authors and contributors
- Establish and inventory of present environment
- Establish QOS practices

Business Requirement 11:

- Provide/establish security standards (HIPAA, FERPA, GLB)

Objective 11:

- Establish a security sub-committee to address the following:
  - Analysis
  - Inventory systems and practices
  - Security education (HIPAA ...,)
  - Protocols and practices (P&P)
  - Design in ... intrusion prevention and detection and response
- Develop encryption standards

Approach 11:

- Appoint security task group
  - Analysis
  - Inventory systems and practices
- Turn over security to ongoing operation group

Business Requirement 12:

- Create the ability to add new sites (aggregation points)

Objective 12:

- Establish a DWDM network with sufficient capacity for expansion (Growth)
- Define process and specifications for connecting new entities.
  - (Equipment, protocols, acceptable use, policies, costs, limits, SLA's)

Approach 12:

- Design network topology
- Acquire 'dark fiber'
- Purchase optical hardware
- Configure install and test

Business Requirement 13:

- (? Verb from page 39) Aggregation – Internet, Internet 2, NLR)

Objective 13:

- Determine network aggregation types (T1, DS3, Metro Ethernet)
- Provide the ability to connect external network providers to SCLR
  - Cost recovery model
- Provide routing to aggregation points from member institutions

Approach 13:

- Negotiate ISP contracts with vendors
- Connect SCLR to Internet, Internet 2, NLR
- Provide routes to members

Business Requirement 14:

- Complete documentation for the entire network architecture.

Objective 14:

- Provide documentation for the following key areas:
  - Hardware (existing)
  - VLAN's and subnets
  - Protocols
  - Authentication methods

Approach 14:

- Select documentation coordinator
- Create documentation repository
- SOP – mandate complete documentation at design, build and change events (change management)

FIBER DISCOVERY REPORT

PREPARED BY FIBERCO
BASED ON
HSSC NETWORK REQUIREMENTS

Date: June 21, 2006

Scope

Research Long Haul networks with all or sub-sets of required inter-city fiber:

- Determine whether dark fiber may be sold
- Determine any available pricing for Fiber, Collocation, and Operations & Maintenance
- Determine basic technical and operational description of available fiber
- Research any Metro networks in each market
- Determine whether dark fiber may be sold
- Determine any available pricing for Fiber and Operations & Maintenance
- Research requirements for building laterals construction in each market
- Determine whether existing building laterals exist with available fiber
- Provide budgetary cost and duration estimates for construction of laterals (where required)

"Lit Services" Discovery (included in Fiber Discovery):

Research providers who would be best placed to provide Lit Services (assume services consist of variations of GigE and/or SONET-based wavelength services)

- Establish list of primary providers (single point of contact to source network)
- Establish list of secondary providers (providers with only partial ability/coverage)
- Determine budgetary pricing and implementation duration for Lit Services
- Output: Overview Report
- Description and pricing of Fiber Discovery alternatives
- Description and pricing of Lit Services alternatives

Methodology

We researched facilities-based telecommunications providers with significant network resources in South Carolina. All providers were contacted directly to determine their available fiber network assets, as well as review their business strategy in terms of making them available for sale.

Sample Dark Fiber Configuration

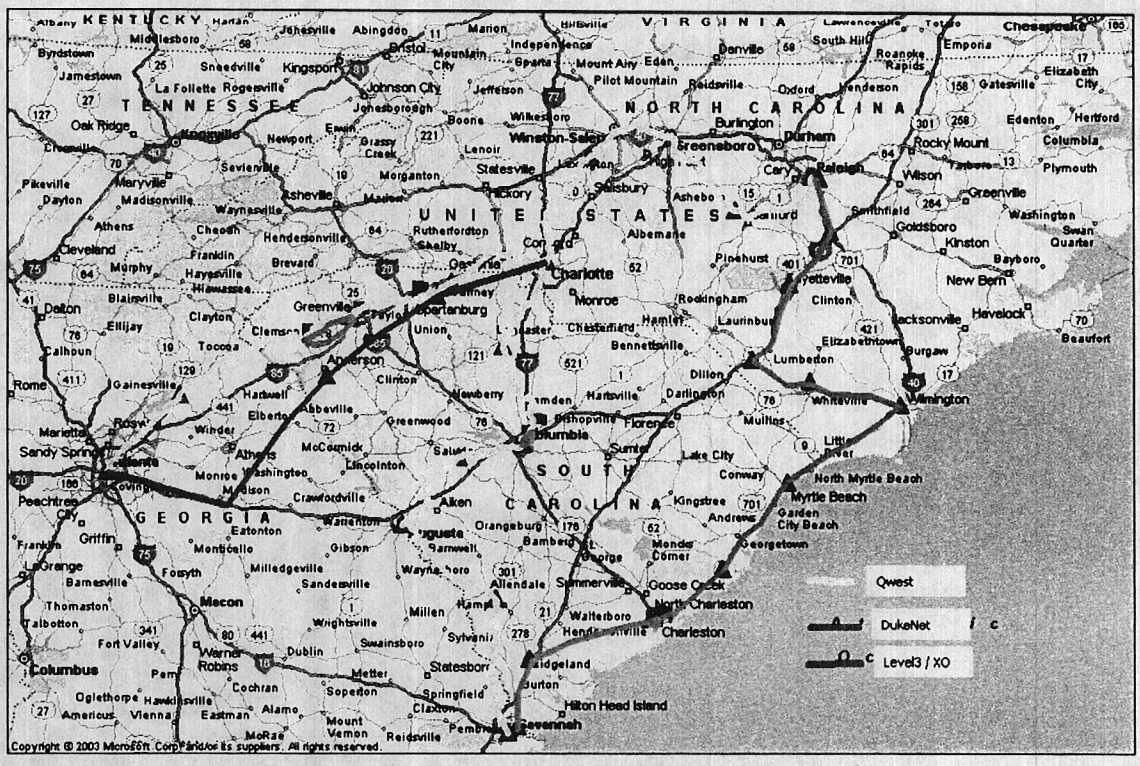
None of the providers surveyed who can provide either long haul and/or metro dark fiber are able to provide a complete dark fiber solution using their own existing infrastructure.

The primary reasons are:

- Do not have sufficient inventory on existing long-haul routes

- "Primary" HSSC locations are not "on-net"

We have therefore synthesized a network configuration that links the "primary" HSSC sites using multiple providers. The overall geographical route map is shown below:



On a metro basis, DukeNet have provided high-level estimates for connectivity from the long-haul providers' POPs to the HSSC premises in Charleston, Clemson, Columbia, Greenville, and Spartanburg. The other dark fiber providers are not well positioned to finance and construct long fiber laterals.

Provider Summary Overview

In this section, we provide a snapshot overview over the companies surveyed as part of this project. "Partial Dark Fiber" indicates companies who based on inventory and business practice will make dark fiber available under certain conditions; partial indicates that no one company surveyed could provide the full network solution.

"No Dark Fiber Available" indicates companies with a significant facilities-based network in South Carolina, but either do not sell dark fiber as a business practice, or do not have sufficient inventory to sell to 3rd parties.